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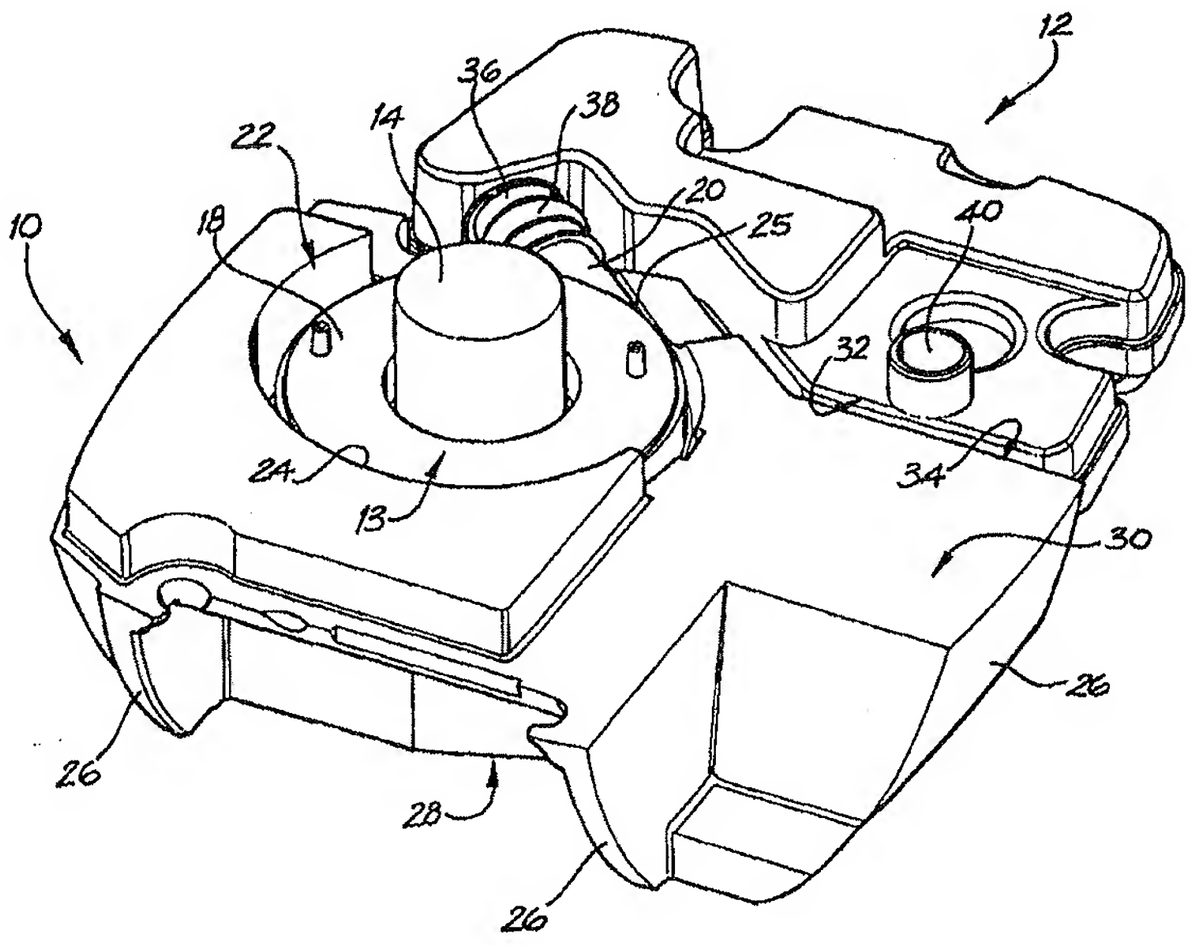

(57) Abstract

A mounting body (10) for mounting a flow generator assembly (13) within an external housing. The body (10) is formed from a compliant material and is adapted to be fixed with respect to the housing. The body (10) also includes a recess of substantially complementary shape to the flow generator assembly (13) to receive and locate same. Also disclosed is an apparatus for providing breathable gas to a patient. The apparatus includes an external apparatus housing, the flow generator assembly (13) and the mounting body (10).

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NOISE DAMPING MOUNTING BODY FOR CPAP COMPRESSOR

FIELD OF THE INVENTION

The present invention relates to a mounting body for mounting a flow generator assembly within an external housing and an apparatus for providing breathable gas to a patient.

The invention has been developed primarily for use in breathable gas supply apparatus used in, for example, the Continuous Positive Airway Pressure (CPAP) treatment of Obstructive Sleep Apnea (OSA) and similar sleep disordered breathing conditions. The invention also finds application in breathable gas delivery systems used for assisted ventilation and mechanical respiration.

BACKGROUND OF THE INVENTION

The pressurised gas supplied in CPAP treatment of OSA serves to pneumatically splint open the patient's airways. The pressure of the supplied gas may be constant, bi-level (in synchronism with patient breathing) or auto-setting in level. Throughout this specification any reference to CPAP is intended to incorporate a reference to any one of, or combinations of, these forms of breathable gas supply.

CPAP treatment is generally administered whilst the patient and any bed partner are sleeping. As the gas supply apparatus is normally located within a few metres of the patient it is desirable to minimise the noise produced by that apparatus to minimise sleep disturbance.

CPAP breathable gas supply apparatus generally comprise a plastics housing or casing having a gas flow generator assembly and an electrical control and power supply system therein. A flexible conduit connects the outlet of the apparatus (at a point on the housing) to a nose and/or mouth mask worn by the patient to communicate the supplied gas to the patient's airways.

The flow generator assembly usually consists of a brushless electric motor driving a fan or turbine. The noise produced by the flow generator assembly has three basic transmission paths to surrounding atmosphere. It is radiated from the apparatus

housing, transmitted from the turbine outlet to be propagated along the conduit that connects the outlet of the apparatus to the patient mask and transmitted from the turbine inlet to be propagated along the gas inlet path (in the opposite direction to the gas flow) to the housing gas inlet and so to atmosphere.

In a prior art approach, the flow generator assembly has been mounted to the apparatus housing by fastening the turbine housing to mounting feet integrally moulded with the apparatus casing with cushioning rubber washers disposed between the housing and feet. In addition to having acoustic air paths for noise emanating from the flow generator through the conduit and housing, vibration produced by the flow generator assembly is transmitted through the feet to the housing, which acts as a panel radiator, and radiates noise therefrom. The vibration energy reaching the casing can also result in a buzzing noise or the like that can be particularly disturbing to the patient and any bed partner.

An attempt to reduce noise radiated from the housing has involved attaching numerous, for example about ten, blocks of acoustically absorptive foam to the inner surfaces of the apparatus housing. However, this increases the complexity, and thereby the cost, of assembling the apparatus.

Another approach is used in the applicant's bi-level CPAP apparatus model VPAPII. The VPAPII includes a sound enclosure within the apparatus housing having an outlet chamber mounted therein. The metal sound enclosure has a first and second chamber, each having a port to allow the passage of air into the first chamber through to, and then out of, the second chamber. The flow generator assembly and the outlet chamber are located in the second chamber. Air is drawn past a baffle and into the first chamber which includes a step-like labyrinth baffle allowing the free flow of air through the first chamber into the second chamber whilst attenuating the noise from the flow generator assembly propagating along the air inlet path. The internal surfaces of the sound enclosure are lined with sound absorbing polyurethane skinned foam.

In one version of VPAPII, the flow generator assembly is mounted within the sound enclosure and attached to the outlet chamber by a rigid metal mounting bracket. In another earlier version, the flow generator assembly sat on one inner face of the

second chamber and was cushioned by EVA foam that was in turn adhered to the second chamber inner face. In both versions, the blower air path outlet is secured to the inlet port of the outlet chamber by way of a silicone rubber conduit.

The outlet chamber is formed as one substantially rectangular chamber moulded from "ignition resistant" ABS. Foam is adhered to the outlet chamber's internal surfaces but otherwise the outlet chamber is 'empty' in that it has no labyrinthine or tortuous path.

The VPAPII, whilst being quieter than previous apparatus, requires expensive materials to produce, is complex in both manufacture and assembly and does not allow for rapid reassembly after servicing. It also utilises steel components which are relatively heavy and affect the portability of the apparatus.

It is an object of the present invention to substantially overcome or at least ameliorate one or more of the deficiencies of the prior art.

SUMMARY OF THE INVENTION

Accordingly, in a first aspect, the present invention discloses a mounting body for mounting a flow generator assembly within an external housing, the body being formed from a compliant material and adapted to be fixed with respect to said housing and including a recess of substantially complementary shape to said flow generator assembly to receive and locate same.

In a second aspect, the present invention discloses an apparatus for providing breathable gas to a patient, the apparatus includes an external apparatus housing, a flow generator assembly, and a mounting body of compliant material fixed with respect to said housing including a recess of complementary shape to said flow generator assembly to receive and locate same.

In the present specification, the terminology "compliant material" is intended to encompass any material having the ability to absorb vibrations, for example in the manner of an acoustic dampening foam, as well as being sufficiently structurally rigid to achieve a mounting function and support the weight of the flow generator assembly.

Examples of compliant material are:

(1) Polyurethane, being a foamed thermo-setting plastic. The foam can be, for example, polyester-polyurethane foam or polyether-polyurethane foam; and

(2) An elastomer such as foamed silicone.

Preferably, the mounting body includes one or more external surfaces adapted to be complementary to, and engage with, adjacent internal surfaces of the housing to locate the body with respect to the housing.

The mounting body is preferably produced from a single piece of compliant material. Alternatively, the body may be formed from a plurality of compliant components fitted, adhered or otherwise bonded to one another.

The flow generator assembly is preferably snugly received, and desirably substantially enveloped, within the recess of the body. Any exposed surfaces of the flow generator assembly are preferably covered by a further foam insert of complementary shape to the recess.

The body is preferably adapted to mount the flow generator in isolation from any contact with the housing.

The flow generator recess in the body preferably includes an orifice for allowing gas to communicate with the inlet of the flow generator.

In an embodiment, the mounting body preferably includes at least one wall disposed, after assembly, adjacent an internal wall of said housing, said body wall including channel means which co-operate with said housing internal wall to provide an inlet duct from atmosphere to said orifice. If desired, a layer of compliant material can be disposed between the housing wall and the body, the layer co-operating with the channel means to form the inlet duct.

In another embodiment, the inlet duct is formed internal of the mounting body.

The inlet duct is preferably a tortuous path to reduce noise propagating from the flow generator assembly to the apparatus air inlet.

The flow generator recess is desirably on the opposite side of the mounting body to the inlet duct with the orifice providing fluid communication therebetween.

In a further embodiment, the mounting body includes a plurality of depressions, perforations, honeycombs, sub-ducts or sub-channels opening from the

channel means and/or inlet duct and extending away therefrom into said mounting body.

In a yet further embodiment, the mounting body is releasably mounted to the apparatus housing of the breathable gas providing apparatus so as to permit removal and replacement of the mounting body to achieve replacement, cleaning and/or sterilisation of the channels means and/or the inlet duct that constitutes the gas flow path through the mounting body.

The mounting body can also, in preferred forms, be shaped for supporting and locating other components of the breathable gas providing apparatus. As an example, the mounting body can include a recess to receive and locate an electrical control panel. Alternatively, the mounting body can include one or more protuberances or other support structures to support said control panel.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described, by way of examples only, with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of the first embodiment of the mounting body shown adjacent a complementary shaped muffler;

Fig. 2 is a perspective view of the body shown in Fig. 1 rotated by approximately 90°;

Fig. 3 is a plan view of a second embodiment of a mounting body;

Fig. 4 is a plan view of the body shown in Fig. 3 with the flow generator removed;

Fig. 5 is an underside plan view of the body shown in Fig. 4;

Fig. 6 is a plan view to Fig. 4 including a further resilient body in exploded relation;

Fig. 7 is a perspective view of a third embodiment of a mounting body;

Fig. 8 is an underside plan view of the body shown in Fig. 7;

Fig. 9 is a plan view of the body shown in Fig. 7 adjacent a muffler and within a breathable gas supply apparatus housing;

Fig. 10 is a perspective view of a fourth embodiment of a mounting body; and

Fig. 11 is an underside perspective view of a fifth embodiment of a mounting body.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1 and 2 show a first embodiment of a mounting body 10 according to the invention adjacent a complementary shaped muffler 12 for use within the housing of a breathable gas supply apparatus (not shown). A flow generator assembly 13 is located within the mounting body 10 as will be hereinafter explained in more detail. The flow generator assembly 13 comprises a brushless electric motor 14 which drives a turbine (not shown) within a toroidal turbine housing 18 and a tangential outlet duct 20.

The mounting body 10 is formed from a substantially open cell polyurethane foam having acoustic absorptive properties, such as 1SF-1350 type manufactured by URETEC.

It will be appreciated that although this foam is described as open cell, the terms open cell and closed cell are applicable to two extreme positions. Between the two extremes there is a continuum of variations. The flow resistivity of a foam is used to determine its degree of openness. The preferred acoustic absorptive quality will be found in a foam that is located on the closed side of the middle of the range from open to closed but not at the closed cell extreme. This will ensure that the foam is sufficiently open to absorb noise, sufficiently structurally rigid to provide the necessary mechanical support for the flow generator assembly and also sufficiently resilient to provide vibrational dampening.

Returning to Figs. 1 and 2, the body 10 includes a recess 22 comprising a cylindrical depression 24 of substantially complementary shape to the turbine housing 18 and a channel 25 of substantially complementary shape to the outlet duct 20. The recess 22 is thus sized and shaped to be a snug fit around the exterior of the flow generator assembly 13. The flow generator assembly 13 and the body 10 are assembled into a common unit by pressing the flow generator assembly 13 down into the recess 22.

The outermost surfaces of the sides 26 and underside 28 of the body 10 are shaped to be substantially complementary to adjacent internal walls and bottom of the

apparatus housing (not shown). The flow generator/body unit is assembled into the housing by placing the unit within the housing and securing it relative to the housing by a cover plate (not shown) which extends across top surface 30 of the body 10 and lightly squeezes or sandwiches the body 10 between the plate and the bottom of the housing.

In Figs. 1 and 2, the muffler 12 is provided with a side wall 32 which is of a complementary shape to adjacent side wall 34 of the body 10. Inlet 36 of the muffler 12 is thereby advantageously positioned substantially adjacent the flow generator outlet duct 20 for connecting thereto by a straight coupling 38. The muffler 12 also has an outlet 40. The outer sides and underside of the muffler 12 are similarly of a complementary shape to adjacent sides and bottom of the apparatus housing.

The underside 28 of the body 10 includes channels (not shown) to provide gas communication from atmosphere to the apparatus housing gas inlet and so to a turbine inlet (not shown) located underneath and central of the toroidal turbine housing 18. The channels are shown in, and will be more specifically explained with reference to, the second and third embodiments of the mounting body described below.

Figs. 4 to 6 show a second embodiment of a mounting body 50 in accordance with the present invention in which like features to those previously described in relation to the first embodiment are denoted by like reference numerals. The mounting body 50 is formed from four foam pieces 52, 54, 56 and 58 which are adhered to one another. It will be appreciated, however, that the body can be produced from a single piece of foam or numerous pieces fitted, adhered or otherwise bonded to one another.

The recess 22 in the body 50 is best seen in Fig. 4. As with the first embodiment, the recess 22 is comprised of cylindrical depression 24, to receive the turbine housing 18, and the channel 25, to receive the outlet duct 20.

As best shown in Figs. 4 and 5, the body 50 includes an orifice 64 in the centre of the cylindrical depression 24. After assembly, the orifice 64 is adjacent the inlet (not shown) of the turbine housing 18. As shown in Fig. 5, the underside 28 of the body 50 includes a recess indicated generally at 66 to communicate the gas surrounding the apparatus housing to the orifice 64 and so to the turbine housing inlet.

The recess 66 comprises an inlet channel 68 joining two further channels 70 which communicate gas to the orifice 64. The two channels 70 are positioned either side of underside body portions 72 which serve to support the centre of the body 50 beneath the flow generator 13 and stop the body 50 flexing under the weight of the flow generator assembly 13 and restricting the channels 68 and 70.

When assembled, the underside 28 of the body 50 is disposed substantially flush and adjacent to the bottom of the apparatus housing which, in co-operation with the channels 68 and 70, forms inlet ducts of substantially rectangular cross-section.

Alternatively, the body 50 can be formed with internal channels or a layer of compliant material can be disposed between the underside 28 at the body 50 and the bottom of the housing so that all surfaces of the inlet duct are compliant material.

Further, the opening of the inlet duct 68 can also be moulded to the shape of the gas inlet in the apparatus housing. This effectively seals the inlet ducts to the housing gas inlet and ensures air is only drawn through the inlet and not other openings which can create noise. Moreover, this also ensures that all inlet air will be drawn through any filters or the like.

As previously stated, the body 50 is located within the breathable gas supply apparatus housing with its top and bottom surface 30 and 28 sandwiched between the bottom of the flow generator housing and cover plate. Fig. 6 shows a foam mounting insert 74 which is of complementary shape to the flow generator 13 and which is placed between the flow generator 13 and the mounting plate to cover the exposed surface of the flow generator assembly 13 and snugly sandwich the flow generator assembly 13 within the boundaries of the body 50 and in isolation from direct contact from the cover plate and apparatus housing.

Figs. 7 to 9 show a third embodiment of a unitary mounting body 80 according to the invention in which like reference numerals for the first and second embodiments denote like features. Fig. 9 shows the mounting body 80 upon assembly adjacent a complementary shaped muffler 82 within a breathable gas supply apparatus housing 84.

Fig. 10 shows a fourth embodiment of a mounting body 90 that includes an integral outlet muffler 92 shown in phantom. The body 90 includes a main block 93

having a recess and a complimentary shaped insert 94. One or other or both of the block 93 and the insert 94 include a recess which defines the tortuous cavity or chamber 91 of the outlet muffler 92 between muffler inlet 95 and muffler outlet 96. The insert 94 is adhered/bonded to the block 93. The body exterior is then sealed with a coating, for example FLEXANE LIQUID 60 from DEVCON, so pressurised air will not leak through the body 90 or the insert 94 in preference to flowing through the muffler outlet 96. The air flow path through the block 90 and insert 94 is generally indicated by arrows 98.

Fig. 11 shows the underside a fifth embodiment of a mounting body 100 which includes a recess 102 to locate a block 104 indicated in phantom (not shown) of a relatively more open cell sound absorptive foam than the body 100.

Sound waves (noise) travelling opposite to the gas flow direction from the flow generator assembly along the channels 70, as indicated by arrows 106, are reduced as they reflect from, or are partially absorbed by, the more sound absorptive block 104. Noise travel is also reduced by the non-smooth profile of the channels 70. The surfaces of the channels can also be corrugated or otherwise have a textured, irregular or rough surface to attenuate noise by promoting internal reflections and the like.

In a sixth embodiment of the invention (not shown) the mounting body has its external sides and underside coated with a hard plastics skin which serves as the apparatus housing. This embodiment of the invention combines the mounting device and apparatus housing into a single component and further simplifies manufacture and assembly. In an alternative form of the sixth embodiment (not shown), the body is moulded with an internal density gradient ranging from more dense and relatively rigid at the exterior walls to less dense and relatively resilient or compliant at the interior walls.

In a seventh embodiment (not shown) the body is produced from SORBATHANE (Trade Mark) and comprises a plastics skin around gel-filled cavities.

In an eighth embodiment (not shown), the mounting body includes a plurality of depressions, perforations, honeycombs, sub-ducts or sub-channels opening from the channel means and/or inlet duct and extending away therefrom into said mounting

body. The depression, perforations, honeycombs, sub-ducts and/or sub channels improve the noise absorbing properties of the mounting body.

In a ninth embodiment (not shown), the mounting body is releasably mounted to the apparatus housing of the breathable gas providing apparatus so as to permit removal and replacement of the mounting body. This permits simple and quick replacement, cleaning and/or sterilisation of the channels means and/or the inlet duct that constitute the gas flow path through the mounting body.

In a tenth embodiment (not shown), the mounting body is shaped for supporting and locating other components of the breathable gas providing apparatus. As an example, the mounting body can include a recess to receive and locate an electrical control panel. Alternatively, the mounting body can include one or more protuberances or other support structures to support said control panel.

It is thought that the embodiments of the mounting bodies described above reduce radiated and transmitted noise in several different ways.

Firstly, the acoustically absorptive properties of the compliant body attenuate noise radiated from the flow generator assembly thereby reducing the level of noise reaching the apparatus housing.

Secondly, the body acts as a dampener and isolator to reduce the transfer of vibration from the flow generator assembly to the housing and lessoning apparatus vibration and the like.

Thirdly, noise produced by air being drawn into the flow generator inlet is also reduced as three of the four walls of the inlet duct are formed from the acoustically absorptive foam. A similar effect is achieved in respect of noise propagated from the flow generator assembly towards the patient mark conduit when the outlet muffler housing is also produced from a similar compliant material.

Further, noise from the flow generator assembly propagating through the inlet path opposite the gas flow direction is reduced as it must travel along the corrugated, tortuous path of the inlet channels through the compliant material in order to exit the apparatus housing at the air inlet.

A comparative test of a flow generator assembly with and without the mounting body of Figs. 1 and 2 has been performed, and gives the following results for measured sound pressure level (L_{eq}) at 0.5m:

Condition	L_{eq} (dBA)
Without Mounting Body	66
With Mounting Body	51

The above described embodiments of the invention possess numerous advantages over the mounting devices and methods of the prior art.

Firstly, as discussed above, the breathable gas apparatus utilising the mounting bodies previously described can be configured to be quieter than those of the prior art.

Secondly, assembly of the gas supply apparatus utilising the mounting bodies of the present invention is simpler and thereby less expensive than those of the prior art as assembly is basically accomplished by pressing the flow generator assembly into the snug recess of the body and then placing the body in the flow generator housing for retention by the cover plate. This is in contrast to the prior art assembly procedure which involved bolting or screwing the flow generator assembly to the housing and/or other components and then attaching, numerous blocks of acoustically absorptive foam to the internal walls of the flow generator housing.

Assembly is especially simple with the fourth, fifth and sixth embodiments.

The cost of the compliant components are also less than that of the plastics and metal components thereby reducing overall apparatus cost.

Further, embodiments of the invention allow the apparatus to be rapidly and cheaply repaired or cleaned by disposing of those components that form part of the gas supply path, including, for example, the entire mounting body. Inexpensive replacement of the air path components obviates the need to sterilise the apparatus which is especially advantageous for breathable gas supply apparatus used, for example, in hospitals to treat a number of different patients. Prior art apparatus must be sterilised each time a different patient is treated. This advantage is enhanced in the

fourth embodiment in which nearly all the components in the flow path are formed from compliant material.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art, that the invention may be embodied in many other forms.

CLAIMS:

1. A mounting body for mounting a flow generator assembly within an external housing, the body being formed from a compliant material and adapted to be fixed with respect to said housing and including a recess of substantially complementary shape to said flow generator assembly to receive and locate same.

2. A mounting body as claimed in claim 1, wherein the mounting body includes one or more external surfaces adapted to be complementary to, and engage with, adjacent internal surfaces of the housing to locate the body with respect to the housing.

3. A mounting body as claimed in claim 1 or 2, wherein the mounting body is produced from a single piece of compliant material.

4. A mounting body as claimed in claim 1 or 2, wherein the body is formed from a plurality of compliant components fitted, adhered or otherwise bonded to one another.

5. A mounting body as claimed in any one of the preceding claims, wherein the flow generator assembly is snugly received within the recess of the body.

6. A mounting body as claimed in any one of the preceding claims, wherein the flow generator assembly is substantially enveloped within the recess of the body.

7. A mounting body as claimed in any one of the preceding claims, wherein any exposed surfaces of the flow generator assembly are covered by a further foam insert of complementary shape to the recess.

8. A mounting body as claimed in any one of the preceding claims, wherein the body is adapted to mount the flow generator in isolation from any contact with the housing.

9. A mounting body as claimed in any one of the preceding claims, wherein the flow generator recess in the mounting body includes an orifice for allowing gas to communicate with the inlet of the flow generator.

10. A mounting body as claimed in claim 9, wherein the mounting body includes at least one wall disposed, after assembly, adjacent an internal wall of said

housing, said body wall including channel means which co-operate with said housing internal wall to provide an inlet duct from atmosphere to the orifice.

11. A mounting body as claimed in claim 10, wherein a layer of compliant material is disposed between the housing wall and the body, the layer co-operating with the channel means to form the inlet duct.

12. A mounting body as claimed in claim 10 or 11 wherein surfaces of the channel means are corrugated, textured, irregular or rough.

13. A mounting body as claimed in claim 9, wherein an inlet duct is formed internal of the mounting body for allowing communication from atmosphere to the orifice.

14. A mounting body as claimed in claims 10, 11 or 12, wherein the inlet duct is a tortuous path to reduce noise propagating from the flow generator assembly to the apparatus air inlet.

15. A mounting body as claimed in claim 11, 12, 13 or 14, wherein the flow generator recess is on the opposite side of the mounting body to the inlet duct with the orifice providing fluid communication therebetween.

16. A mounting body as claimed in any one of the preceding claims, wherein the mounting body is formed from a substantially open cell polyurethane foam.

17. A mounting body as claimed in claim 16, wherein the polyurethane foam is 1SF-1350 type manufactured by URETEC.

18. A mounting body as claimed in any one of the preceding claims, wherein the recess is substantially cylindrical.

19. A mounting body as claimed in any one of the preceding claims, wherein the mounting body includes an integral outlet muffler.

20. A mounting body as claimed in any one of the preceding claims, wherein the exterior of the mounting body is sealed.

21. A mounting body as claimed in claim 20, wherein the exterior is sealed by coating with FLEXANE 60 manufactured by DEVCON.

22. A mounting body as claimed in any one of the preceding claims, wherein the mounting body includes an insert in the gas flow path of the mounting body, the insert being a more open cell sound absorptive foam than the mounting body.

23. A mounting body as claimed in any one of the preceding claims, wherein the mounting body includes a hard plastics exterior skin.

24. A mounting body as claimed in any one of the preceding claims, wherein the mounting body is moulded with an internal density gradient ranging from more dense and relatively rigid at exterior walls to less dense and relatively resilient at interior walls.

25. A mounting body as claimed in any one of the preceding claims, wherein the mounting body is produced from SORBATHANE and comprises a plastics skin around gel-filled cavities.

26. A mounting body as claimed in any one of the preceding claims, wherein the mounting body includes a plurality of depressions, perforations, honeycombs, sub-ducts or sub-channels opening from the channel means and/or inlet duct and extending away therefrom into said mounting body.

27. A mounting body as claimed in any one of the preceding claims, wherein the mounting body is releasably mounted to the apparatus housing of the breathable gas providing apparatus so as to permit removal and replacement of the mounting body.

28. An apparatus for providing breathable gas to a patient, the apparatus includes an external apparatus housing, a flow generator assembly, and a mounting body of compliant material fixed with respect to said housing including a recess of complementary shape to said flow generator assembly to receive and locate same.

29. An apparatus as claimed in claim 28, wherein the mounting body is shaped for supporting and locating other components of the breathable gas providing apparatus.

30. An apparatus for providing breathable gas to a patient, the apparatus including an external apparatus housing, a flow generator assembly and a mounting body as claimed in any one of claims 1 to 27.

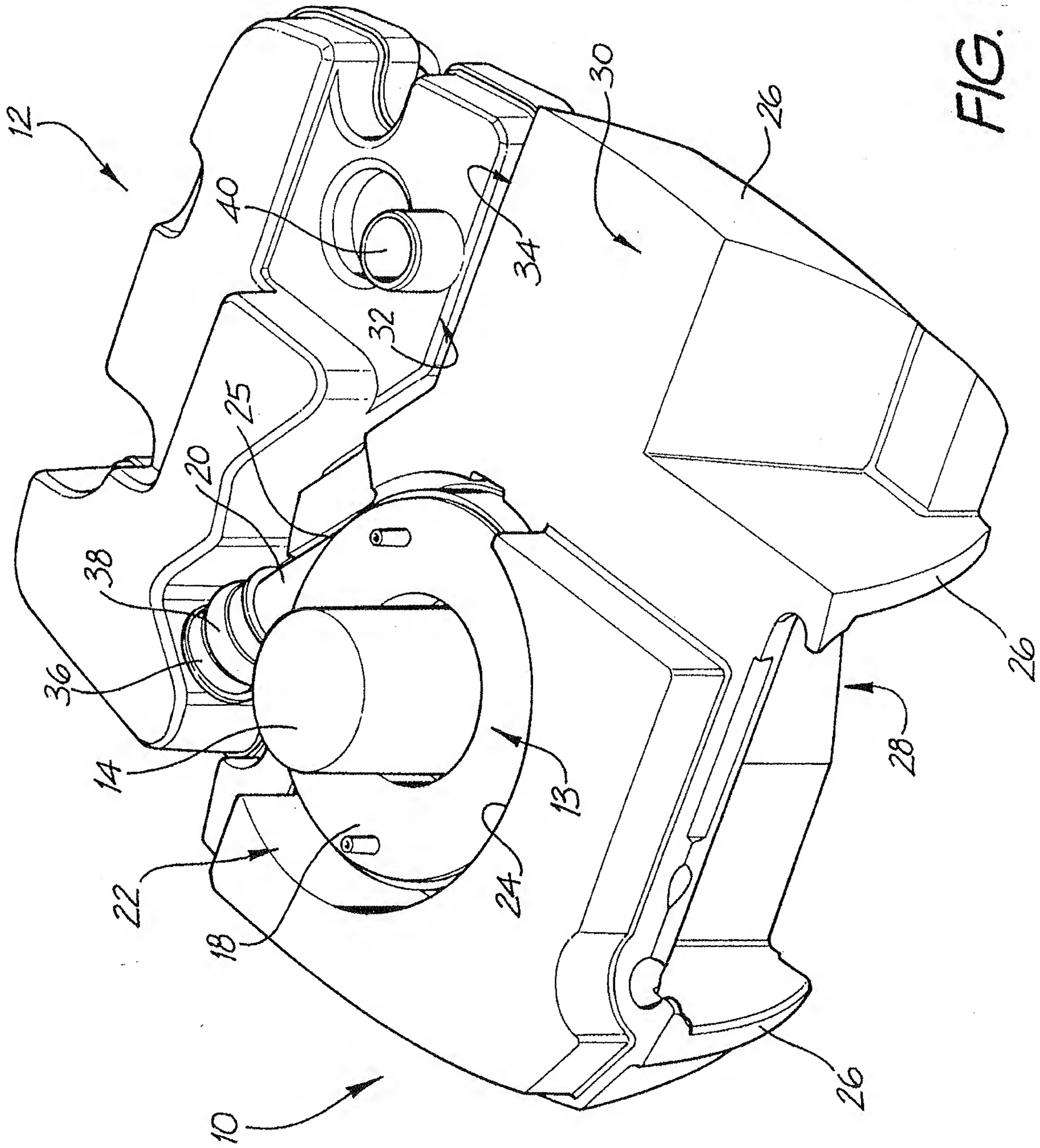

FIG. 1

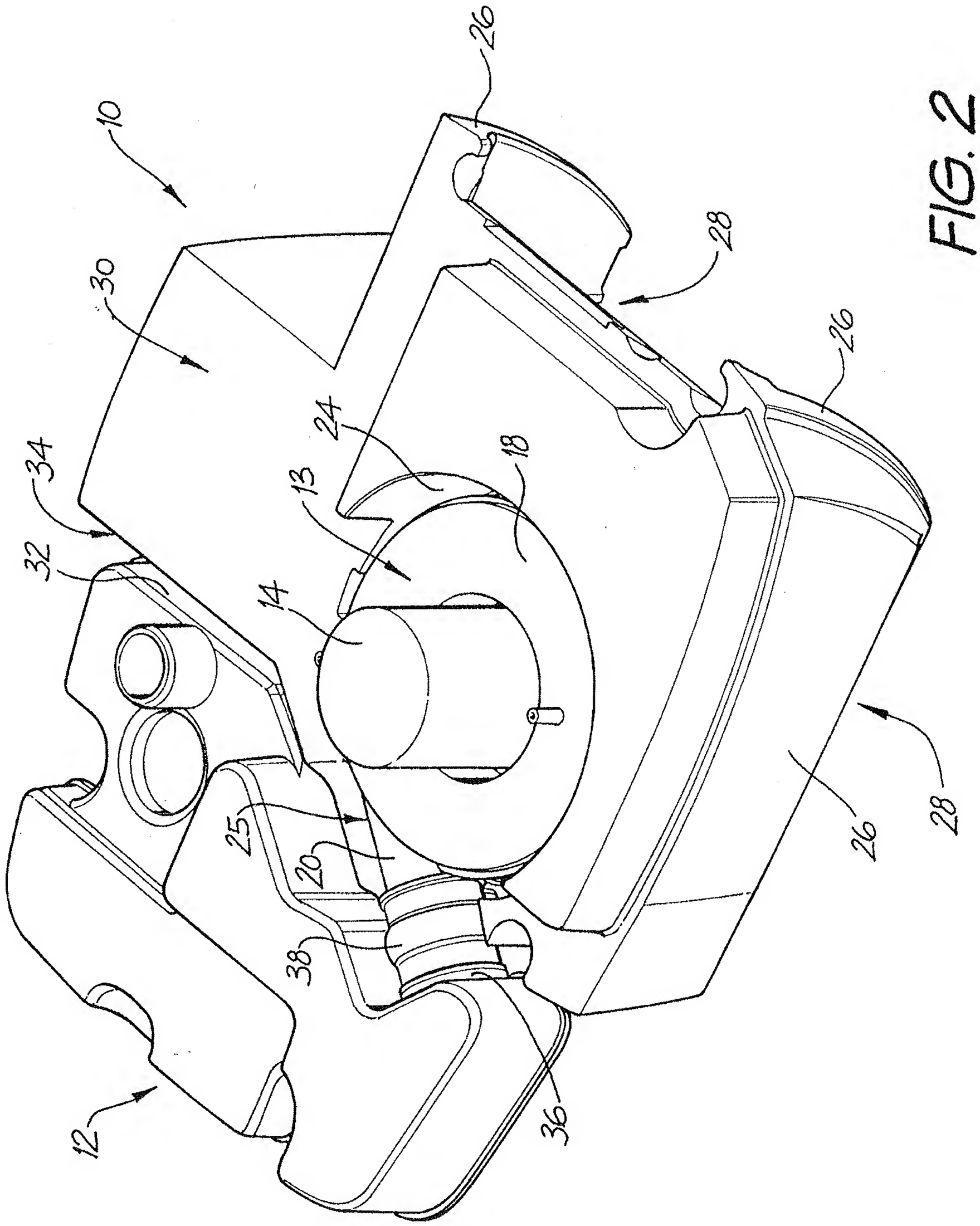

FIG. 2

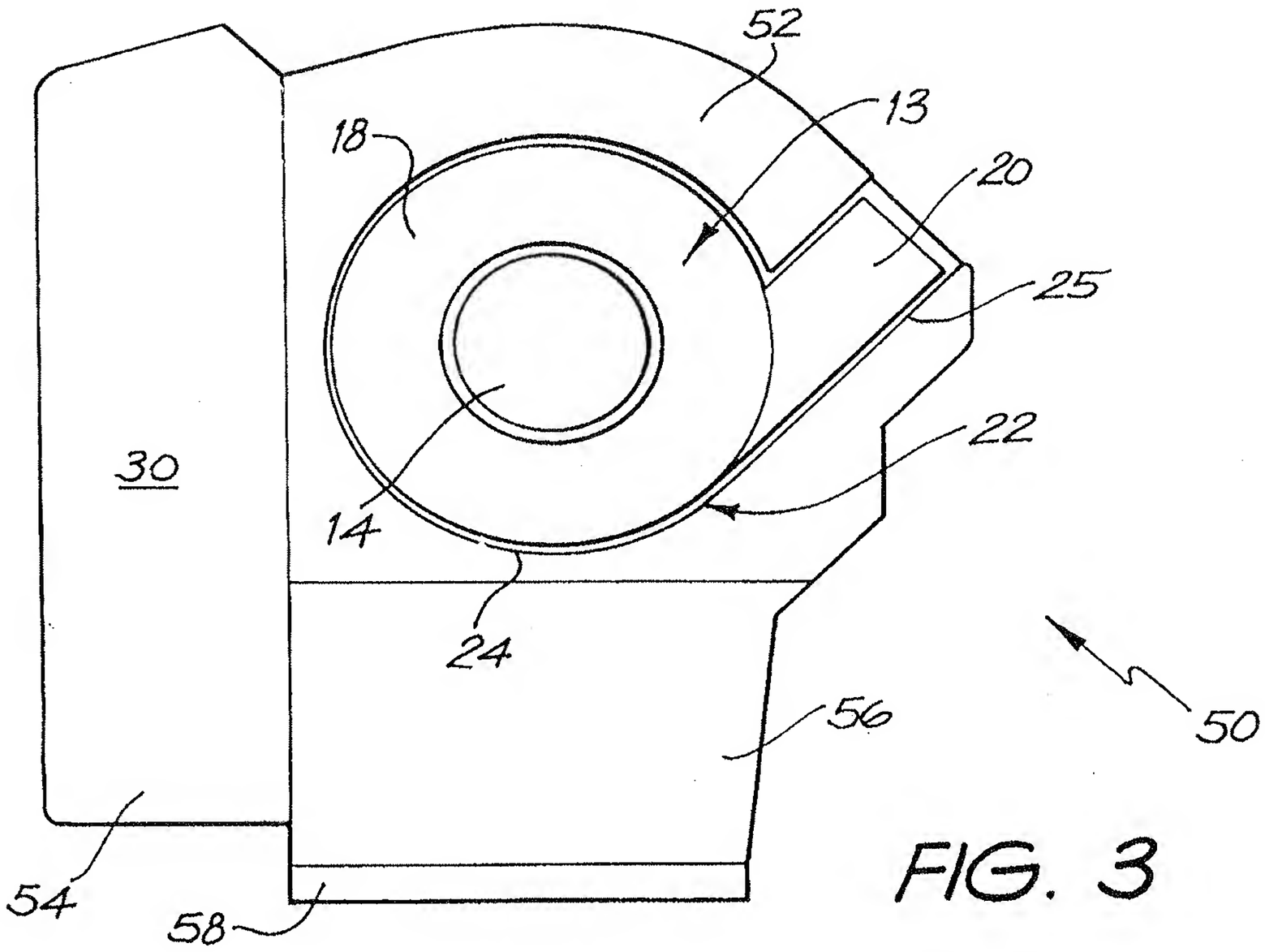

FIG. 3

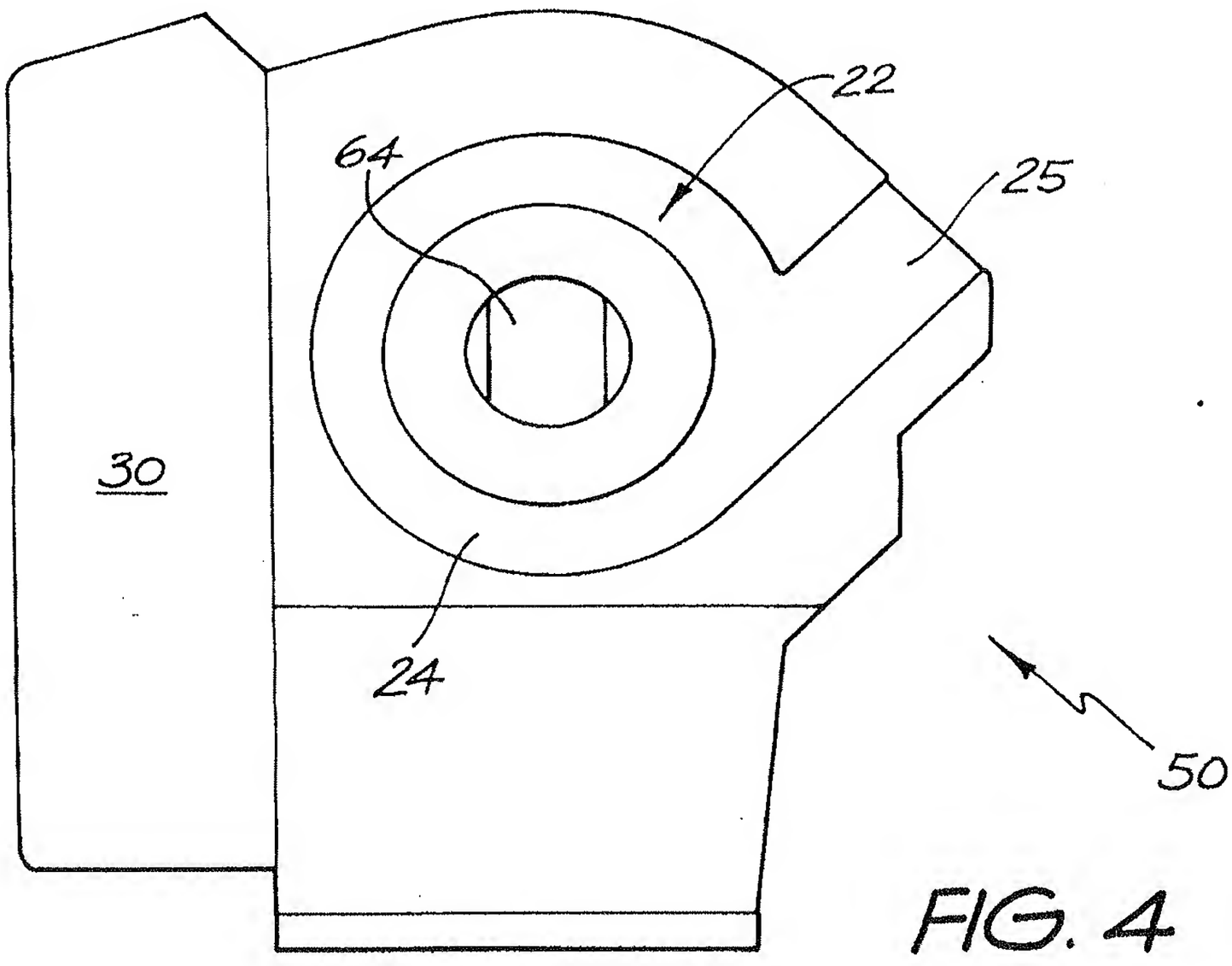

FIG. 4

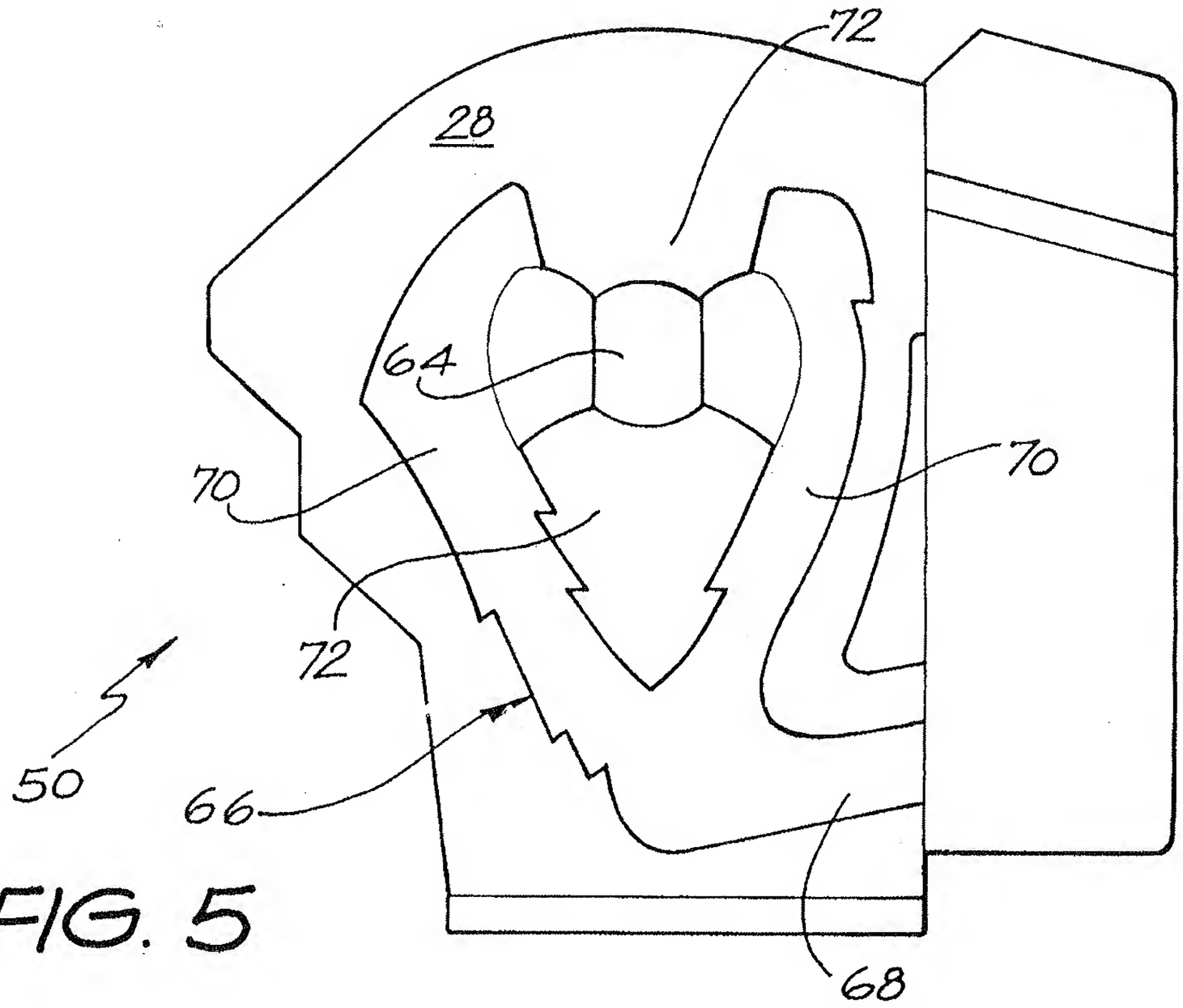

FIG. 5

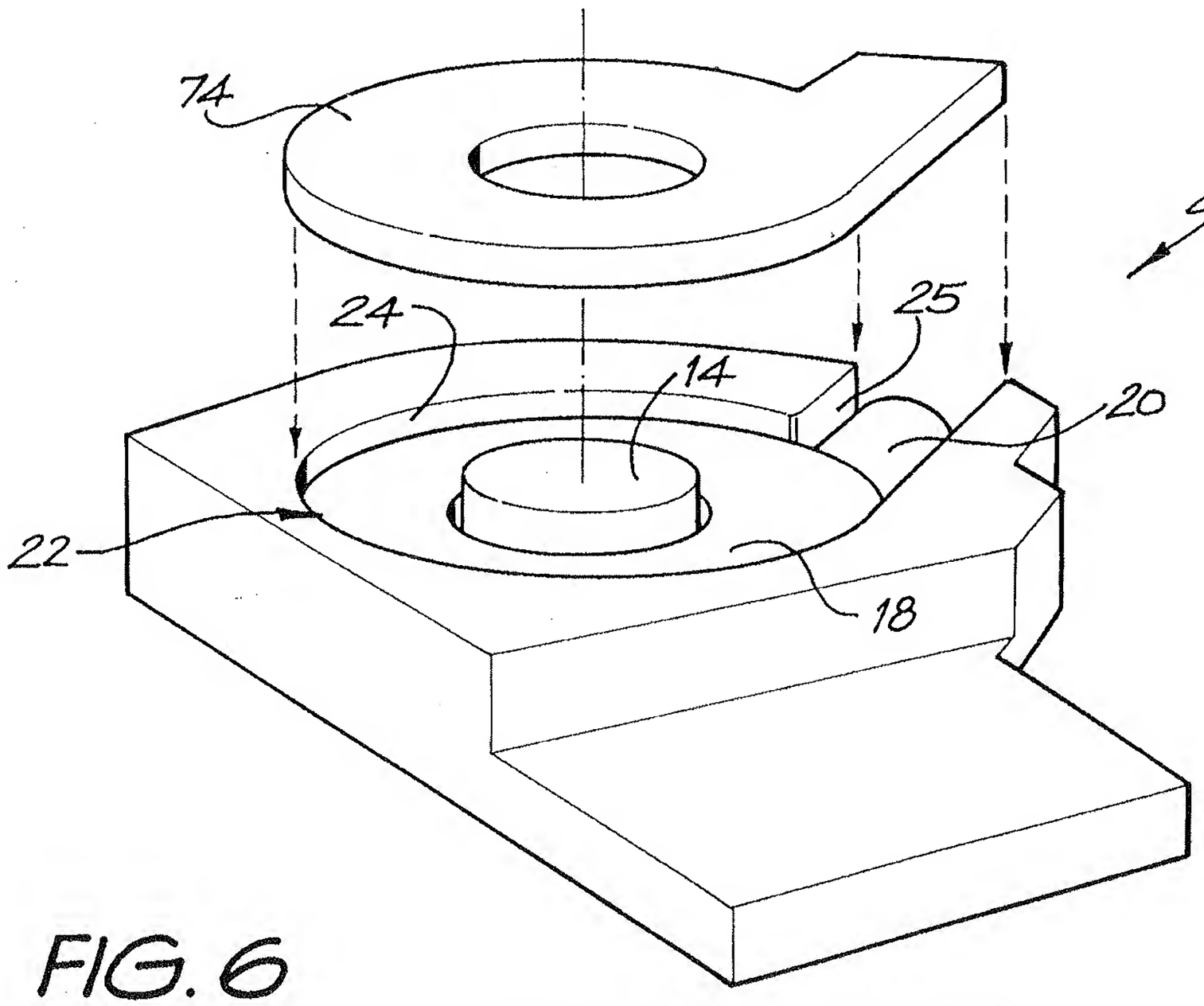

FIG. 6

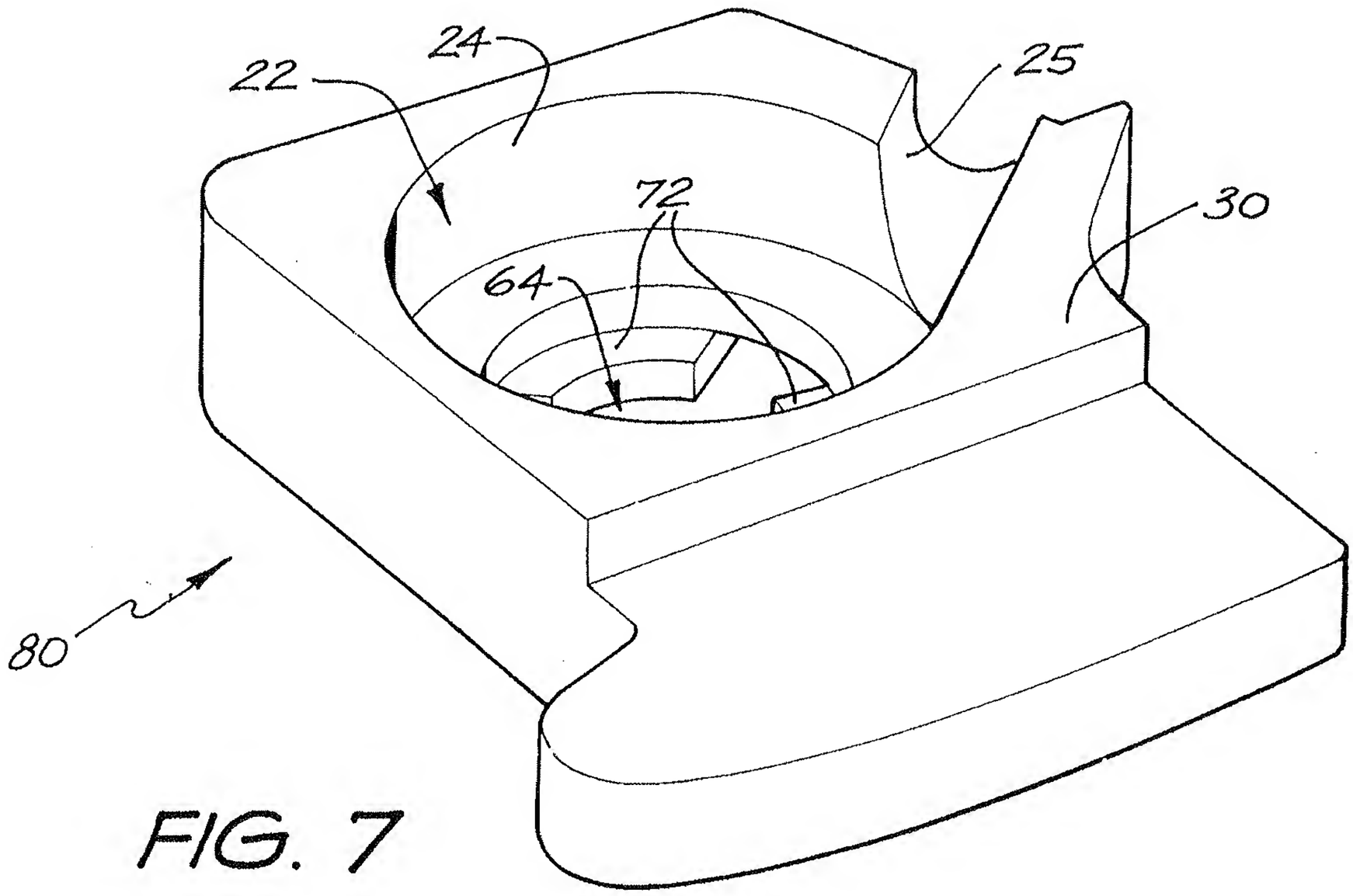

FIG. 7

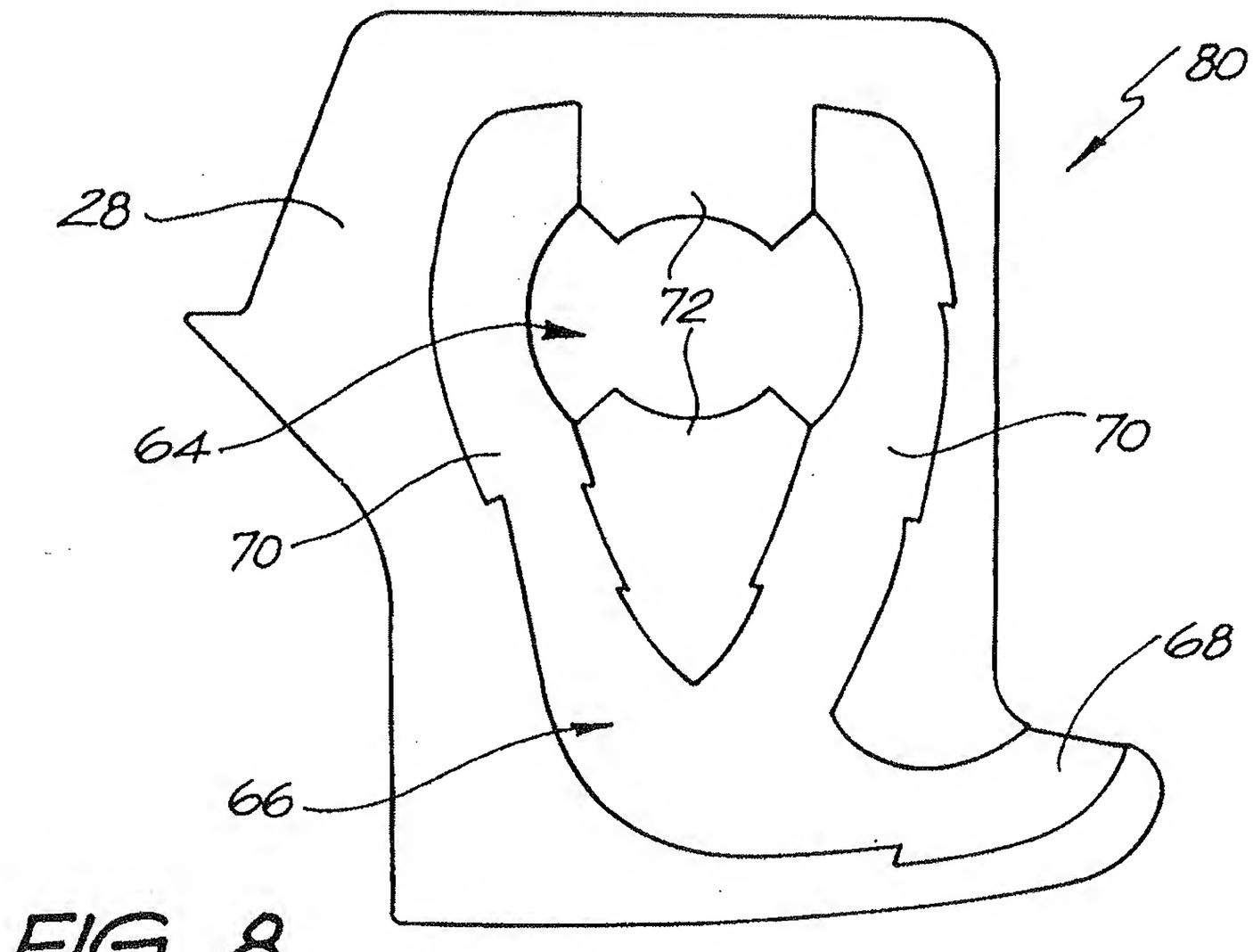

FIG. 8

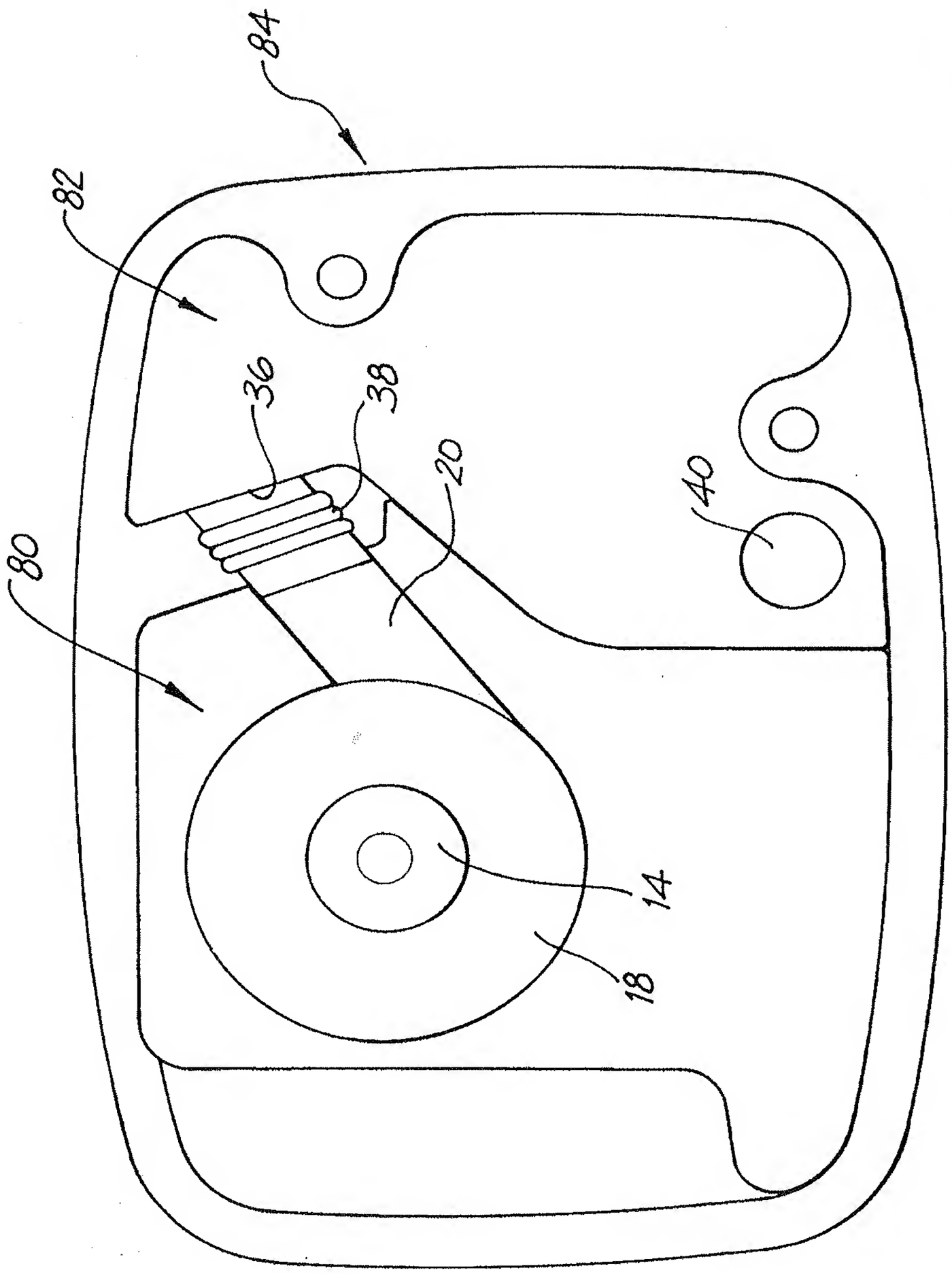

FIG. 9

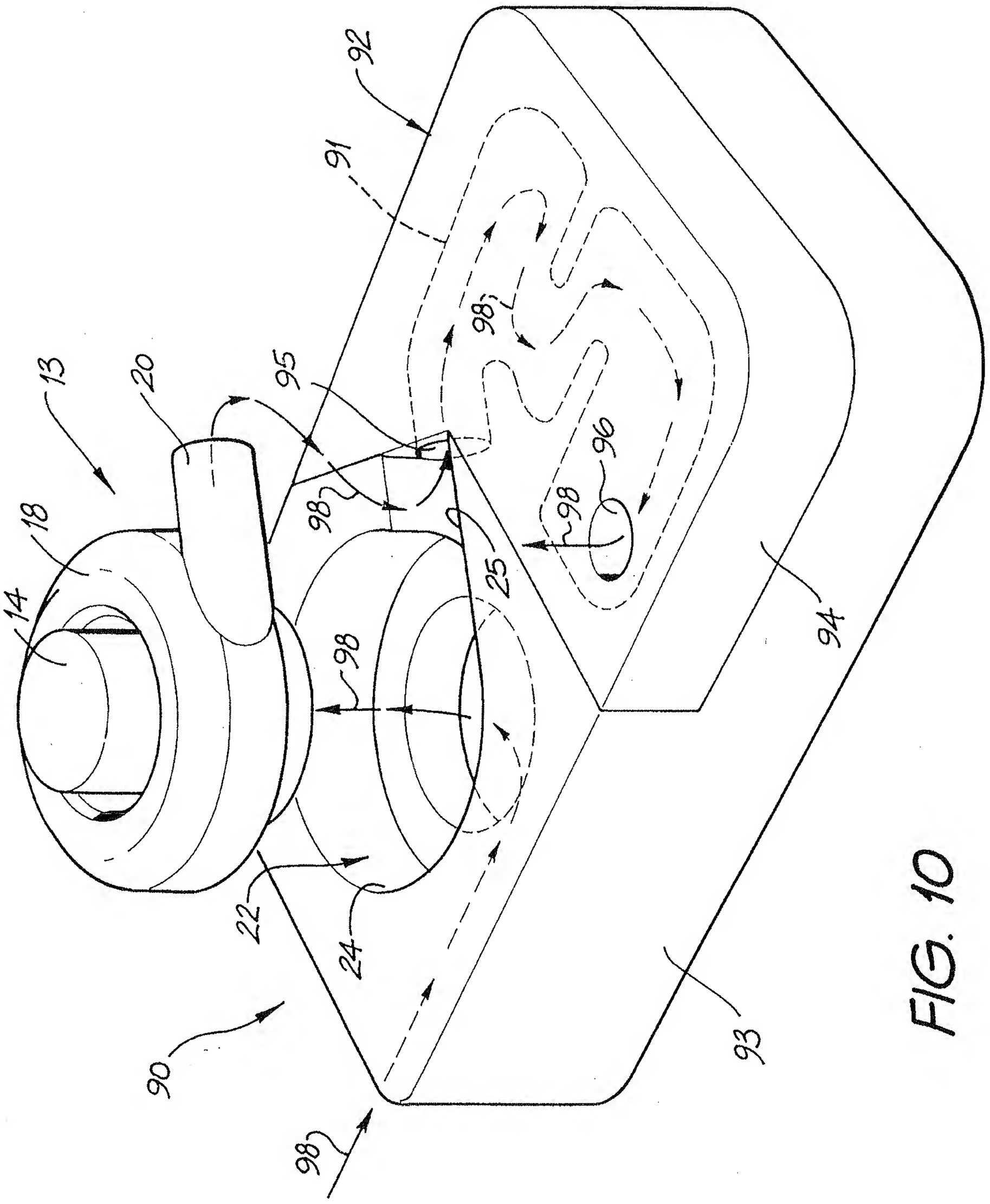

FIG. 10

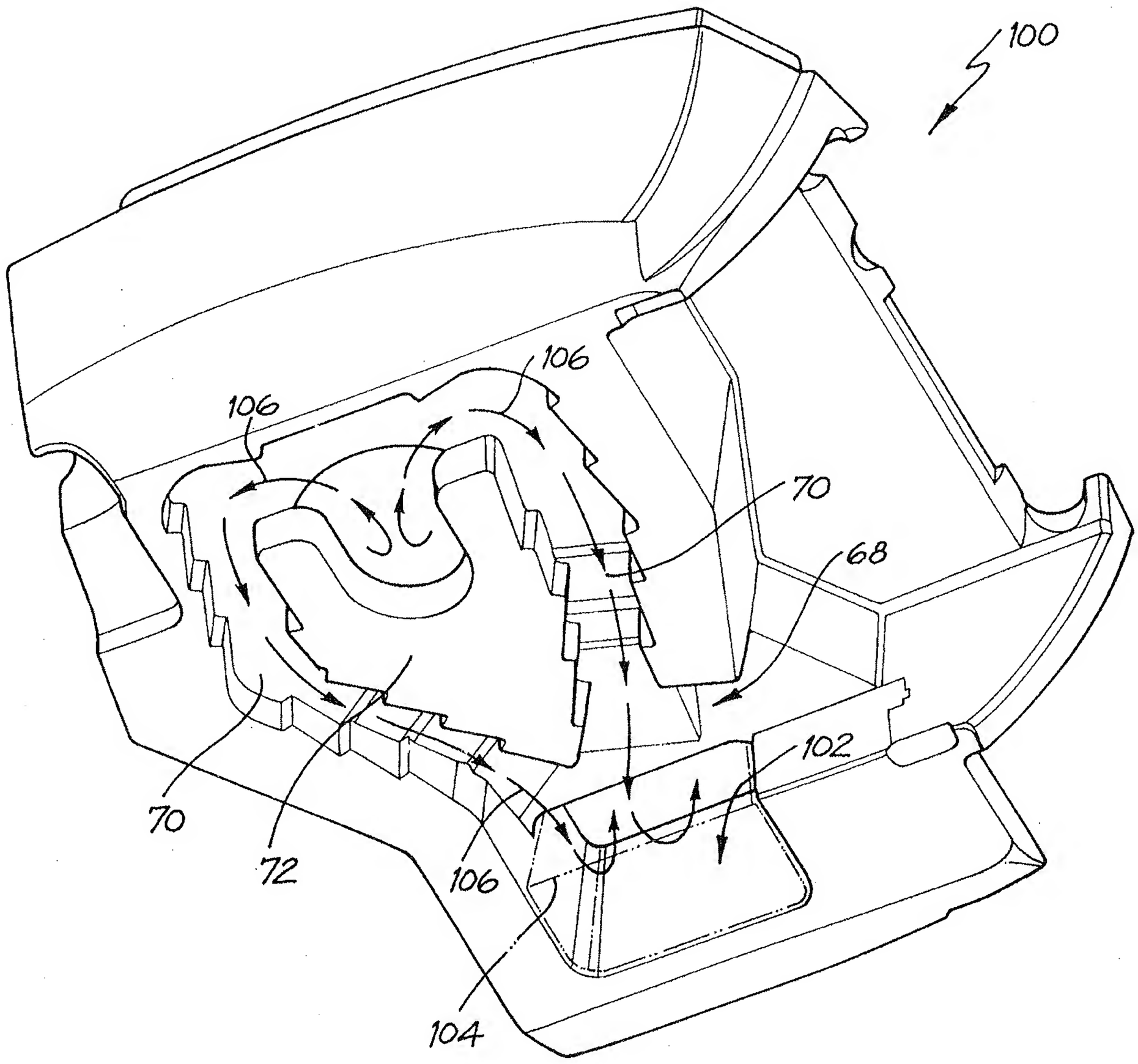

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 98/00912

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: A61M 16/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Electronic search as below.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT, JAPIO (PUMP MOTOR GENERATOR COMPRESSOR, HOUS ENCAS CASING CASE SHELL, FOAM COMPLIANT FLEXIBL DEFORM RUBBER, SOUND VIBRAT NOISE ATTENUAT DAMP PROOF ABSORB)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5567127 A (WENTZ) 22 October 1996, See figure 1 and 2.	1 to 30
X	GB 2271811 A (MANGAR AIDS LIMITED) 27 April 1994, See figure 1.	1 to 30
X	EP 62166 A2 (NIXDORF COMPUTER AG) 13 October 1982, See figure 1.	1 to 30

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 January 1999	20 JAN 1999
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **PETER T. WEST** Telephone No.: (02) 6283 2108

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 98/00912

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 388525 A1 (PORSCHE AG) 26 September 1990, See figures.	1 to 30
X	DE 3402603 A1 (ELECTROSTAR SCHOTTLE GmbH & Co), See figures.	1 to 30

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU 98/00912

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	5567127						
GB	2271811	DE	69307265	DK	595459	EP	595459
		GB	9222475	GB	9319250	GB	2271811
		US	5407330				
EP	62166	DE	3112591	EP	62166	JP	57169797
EP	388525	DE	3909563	DE	58903680	EP	388525
DE	3402603						

END OF ANNEX